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# Households and environment in the city of São Paulo; problems, perceptions and solutions

Pedro R. Jacobi

**SUMMARY:** *This paper presents findings from a 1,000-household survey in Sao Paulo City that examined environmental problems at the household and neighbourhood levels and the respondents' perceptions with regard to the nature and cause of these problems and the best means for their resolution. The sample was chosen to allow the findings to be representative of six socio-economic strata (so that findings from high, middle and low-income households could be compared) and of different spatial locations so that findings from the central city, inner suburbs and the outer periphery of the city could be compared. The paper reveals in detail the environmental problems and household perceptions that vary most and least between strata and suggests new bases for action in which both government agencies and citizens share responsibility.*

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1. This research project was coordinated in the city of São Paulo by Pedro Jacobi with the collaboration of Leonor Moreira Camara and Yara Castro.

## I. INTRODUCTION

**THIS PAPER PRESENTS** findings from a study on household environmental problems<sup>(1)</sup> in the city of São Paulo that was part of a research programme which included similar studies conducted in Jakarta and Accra.<sup>(2)</sup> The study included interviews with members from 1,000 households, and physical tests of water quality and dampness in a sub-set of 200 households.

The paper is divided into eight sections. Section II explains the research framework, including conceptual and methodological aspects, and Section III provides the socio-environmental context for the city. Sections IV to VI present the findings of the survey on the respondents' perceptions of environmental problems within the dwelling and the neighbourhood; on the relationships between health and the household environment; and on the types of action that can solve environmental problems and improve their quality of life. Section VII draws some

2. The present research is an integral part of a programme to assess urban environmental conditions in Third World cities, and similar studies have been conducted in Greater Accra Metropolitan Area, in Ghana, and in Jakarta, Indonesia. The programme is coordinated by Stockholm Environment Institute in Sweden. Some of the findings from the studies in Accra and in Jakarta were published in *Environment and Urbanization* Vol.5, No.2: Surjadi, Charles, "Respiratory diseases of mothers and children and environmental factors among households in Jakarta" pages 78-86; and Songsore, Jacob and Gordon McGranahan, "Environment, wealth and health; towards an analysis of intra-urban differentials within Greater Accra Metropolitan Area, Ghana", pages 10-24.

conclusions and Section VIII highlights the implications of the research findings for the development of strategies to improve joint actions between citizens and government.

One of the assumptions underlying the research is the relevance of analyzing the precarious nature of state action in protecting the environment or in preventing environmental damage. When this action does not ensure an adequate level of housing and living conditions, it has a great impact on the daily life of households and on their practices. This research approach seeks to identify people's perceptions and practices in relation to the basic problems and to better understand the difficulties they face, particularly those faced by low-income populations. In other words, it means knowing the chain of relations involving what people do or do not identify as environment related problems, what they detect as a source and cause of problems, and what reasons guide their behaviour in the search to resolve the problems.

## II. RESEARCH FRAMEWORK

### a. The Conceptual Framework

**THE APPROACH TO** environmental issues in São Paulo City is developed from a standpoint that considers the whole range of households in the context of both urban problems and the perception of these by people who are directly affected by them. The intersection of these problems and people's perceptions of them helps to improve our understanding of the theoretical and practical issues that fall within the scope of today's urban issues. This also helps respond to the fact that environmental aspects of contemporary urban problems are receiving more attention.

The research sought to provide data for the analysis of urban environmental problems at a household level, and of their relationship to the quality of life as perceived by those directly affected. It also considers the links, as perceived by the inhabitants, between environmental problems and the health problems that affect them. Environment is studied by considering the following variables: environmental problems in the neighbourhood and the household: housing conditions and purchasing power; housing conditions, sanitation facilities and personal health-care; recognition of household problems concerning water supply and storage; solid waste disposal; problems with insects and rodents; and the dwellers' exposure to insecticides and food contamination. Data collected on this whole set of variables was supplemented by enquiries into the inhabitants' perceptions of their health problems in relation to the household environment.

There is another set of variables related to the forms of action the respondents consider as most effective in solving environmental problems, as experienced and perceived in both the household and the neighbourhood, and which particularly concern water supply, sewage systems, solid waste disposal, air quality and the presence of insects and rodents. Each respondent-

ent evaluated whether responsibility for action on these concerns lay largely with government, neighbourhood or individual.

In the case of the city of São Paulo, an urban habitat with enormous dimensions (Greater São Paulo being one of the world's largest urban agglomerations), the word "environment" has several interrelated socio-economic dimensions, although these can remain unnoticed by most of the population. It is assumed here that people's perception of the environment, as is the case in any other perception, does not result only from the actual impacts of real conditions on the individual, but also from the way their intervening actions and cultural values influence the absorption of these impacts.

The research deals with a considerable variety of aspects of people's perceptions, since the urban context of São Paulo shows huge variations in environmental quality that are themselves indications of different public policies for servicing citizens' demands. Thus, while a large proportion of the population, from an environmental point of view, inhabit extremely deteriorated and hazardous areas, others live in areas which cause much less intense damage to the quality of their lives and, in particular, to their health.

The environmental aspects investigated in this research are those where deterioration is most apparent and thus most easily perceived by the population, within a context strongly marked by diversity. In fact, a plausible hypothesis is that this awareness has more to do with a cultural variable than with a reality that is experienced. The point of departure is a broader view of the interdependence of the aspects that are interpreted by the people in the six different strata who were interviewed, namely:

- \* perceptions on access to the services and on their quality;
- \* dwelling and housing conditions;
- \* sanitation habits and conditions;
- \* the links between living conditions and health, as perceived by the dwellers;
- \* perceptions of environmental problems and the types of action needed to solve them; and
- \* degrees of awareness on the possibilities of improving quality of life.

Four aspects, each closely interconnected, are made explicit. The first is recognition of the environmental problems of the neighbourhood and household, particularly those with close links with the environment, and their impacts on health. Such problems are studied from the links that people themselves perceive and the effects of the problems. The second aspect relates to social practices in all their variety and this means not just considering these practices as a reflection of a certain socio-economic situation, but also as a result of socio-cultural factors. Thus, the core references are people's perceptions and expectations, and their evaluations of public services.

The third aspect refers to the relationship between health and household environment.<sup>(3)</sup> The fourth aspect considers what people use to solve, or consider most appropriate to solving,

3. Hardoy, Jorge E. and David Satterthwaite (1987), "Housing and health in the Third World - do architects and planners have a role?", *Cities* Vol.4, No.3, Butterworth Press, pages 221-235.

environmental problems, as well as the means to do so.

By analyzing households' daily practices and perceptions it is possible to understand the differences in social attitudes and practices for families from several different socio-economic strata in the municipality of São Paulo. Although the daily life of each family, as well as its conditions and strategies, can be assumed to have its own features, the perception of certain practices for dealing with environmental problems, the actions taken, and their impact are due to the set of social relations to which the families are attached, and especially those that are essential parts of a world of exclusion and low income.

The analytical core of this approach is framed in a socio-cultural perspective, that is, the perception people have of whether there is a strong interaction between the urban environment and their daily quality of life. What needs to be investigated is whether or not the population has daily information on these interactions, as well as knowledge on, and motivation for, the actions needed to address them. It is also important to examine the extent to which people are aware of personal hygiene practices in relation to environment/health conditions, as well as their degree of engagement in or commitment to the formulation of political demands, and to the forms of action on environmental problems and their impact on transforming their living conditions.

## **b. Methodology and Data Base**

The findings presented here draw from a detailed, structured questionnaire undertaken in 1000 households. The sampling procedure involved proportional stratified homogeneous areas representing six socio-economic strata that were built up by using statistical criteria for areas with similar indicators of quality of life. These homogeneous areas were defined by the Municipal Office of Planning of São Paulo and related to the level of basic sanitation, density of population, child mortality and income level stratum. The sample was apportioned across the six homogeneous strata according to the relative share of households residing in each stratum. This resulted in the selection of 30 districts located all around the city.

The districts included in each stratum - in spite of representing a homogeneous parameter that assigns them a very accurate measure of insertion in the city, in terms of socio-economic profile - present a picture of the complex socio-spatial configuration of the city. Illegal or squatter settlements (termed *favelas* in Brazil) can often be found at the interstices of city areas which are inhabited by people from both high and low-income strata. Thus, there are few areas in the city that do not have a mosaic of different kinds of household, and which in turn reflect the conditions of social inequality that coexist in São Paulo.

Women were the main respondents. Women and children are also the most at risk from household environmental problems. The main health problems considered in the interviews were diarrhoea and acute respiratory infections among children under the age of six.



### III. SOCIO-ENVIRONMENTAL CONTEXT OF THE CITY OF SÃO PAULO

#### a. Urban Context

**THE CITY OF** São Paulo, with a population of almost 10 million inhabitants, is at the centre of what is termed Greater São Paulo which had 15.4 million inhabitants in 1991. The city is going through different growth processes. In the 1980s, the population of the metropolitan region grew at an annual average rate of 1.7 per cent, while that of the city of São Paulo grew at 1.0 per cent. Excluding the central city and considering the 37 municipalities, the average annual growth rate jumps to 3.1 per cent. This phenomenon of a much lower population growth in São Paulo City is the result of a complex concurrence of factors such as the economic crisis, the development of other economic poles and increases in urban land prices. The economic crisis, that has now lasted for a decade, has contributed to both slowing in-migration to the city and to increasing out-migration as people leave to return to their original regions. Within the city of São Paulo, the highest rates of population growth have occurred in suburban areas. Data from the 1991 census suggest that São Paulo's population growth during the 1980s occurred mainly in the most suburban districts, whilst the central districts lost population.<sup>(4)</sup>

Household and occupational structure in São Paulo also went through great changes between 1981 and 1991. The total fertility rate, which in the 1970s was 3.5 fell to 2.1 in the 1980s. The number of persons per dwelling fell from 4.0 persons in the 1970s to 3.5 persons in the 1980s. In terms of occupational structure, 25 per cent of the occupied population worked in the industrial sector, while 70 per cent worked in services; this high proportion in services in the context of the economic crisis is also an indication of increased informal activities.

The 1980s have come to be known as "the lost decade" in Latin America, as most countries suffered serious economic decline after decades of relatively high economic growth. Statistics for the decade show the gradual impoverishment of the city, due to the freezing of per capita income, as well as to inflation, recession and unemployment. This gave rise to a multiplication of tenement houses and *favelas*, thus making the pockets of social/urban poverty more widespread. It also led to the end of uncontrolled in-migration and to rapid land occupation in the city's suburban areas, as noted above. The proportion of the population living in *favelas* which was only 1 per cent in 1973, now stands at 8 per cent (or 820,000 inhabitants). This has grown less than the population in tenement houses, which increased from 1.7 million in 1980 to 3 million by 1990; 28 per cent of the overall population is now housed in tenements.<sup>(5)</sup>

Most of the city's population have housing of inadequate environmental quality. The practices for developing land for housing, and the lack of state action with regard to compliance in land use regulation has created a true "clandestine city" in the suburban areas. This includes roughly 3.5 million people living

4. Rolnik, R., L. Kowarick et al (1990), *São Paulo, crise e mudança*, Brasiliense, São Paulo.

5. SEADE (1991), *Anuário Estatístico de São Paulo*, SEADE, São Paulo.

in tenement houses, another 812,000 in *favelas* and 2.5 million who live in precarious self-built houses in settlements developed on illegal land sub-divisions. According to the 1987 census of *favelas*, there are 1,592 of them in the municipality of São Paulo. Over 48 per cent of households living in them are in the southern areas of the city. Most *favelas* have a small number of household units. Within the city centre, they make up less than 1 per cent of households since this is an area of old settlement. The other northern, eastern and south-western areas show indices closer to the average of 16.5 per cent. In accordance to the different degrees of urbanization, 0.78 per cent of *favelas* are found in the city centre area, 47 per cent in the intermediate belt and 52.2 per cent in the suburban belt.

Urban expansion now faces environmental barriers. There is almost no land suited to urban occupation in the city and suburban growth is taking place on sites that are poorly suited to residential developments. This brings serious risks to the ecological balance of the city and to its inhabitants' quality of life.

6. Data for this section were collected from EMPLASA (1991), *Sumário de dados da Grande São Paulo*, EMPLASA, São Paulo.

### **b. Environment Related Services<sup>(6)</sup>**

According to 1991 data, 93 per cent of the population in the municipality of São Paulo are serviced by water supply systems although the proportion varies considerably, depending on location. The entire population is served by the water supply network in the districts with the highest income stratum. In contrast, in the poorest suburban districts, water supply does not reach 60 per cent of the population, whereas in the most established districts it reaches about 90 per cent.

The city of São Paulo city has a total of 1,700,094 connections to the sewage system, 1,535,797 of which are for dwelling units, and 13,700 are commercial and public authority connections. All the sewage effluent from these units flows into the rivers. Data collected in 1990 show that sewerage networks only service 54 per cent of the overall city population and that 75 per cent of its domestic sewage is collected. Of this, 19 per cent receives primary treatment and 7 per cent secondary treatment in the city's three sewage treatment plants. As with the water supply network, there are differentials in terms of the proportion of households connected but the scale of the differentials is even more striking. The entire population in the most central districts have connections. In suburban districts, the service is only partial and, in some cases, does not even cover 15 per cent of the population.

The daily average amount of domestic solid waste collected in São Paulo City is 10,715 tons. Almost 95 per cent is disposed of as land fill with less than 5 per cent incinerated and/or transformed into fertilizer, and just two tons going to a recycling plant. Even though the landfills receive most of the solid wastes that are collected, they do not have the provision to prevent the contamination of ground water and surface water through run-off and leaching. City landfills are now at the limit of their useful capacity. Not all solid waste collection is under the control of public authorities, because there are 348 points of illegal dump-

ing of solid waste disposal.

São Paulo City faces particular problems of air pollution from industrial, household and motor vehicle emissions but these problems are exacerbated by the fact that the city is surrounded by mountains 1,100 metres high. The climate is dry in the winter and wet in the summer. Atmospheric conditions in the winter often lead to strong thermal inversions that help trap pollutants. During the winter, air pollution problems worsen and when thermal inversions occur there is an increase in the incidence of respiratory diseases. By 1990, emissions from motor vehicles were a significant source of air pollution, which affects virtually the whole city, from the centre to the suburban belt that surrounds it. Noise pollution is also a serious problem, as city dwellers are subjected to excessive noise levels (and their health effects), even in residential areas.

#### IV. RESEARCH FINDINGS

##### a. Environmental Problems at Household and Neighbourhood Level

**THE ANALYSIS OF** environmental problems at neighbourhood and household level provides information on the perceptions of the inhabitants with regard to access to, and quality of, urban services as well as their choices in ranking positive and negative aspects that affect their surroundings.

Data on infrastructure show that households' complaints are especially directed towards the lack of paved roads and pavements (sidewalks) and the lack of access to the public sewerage network. Table 1 shows that 73.6 per cent of households have paved roads and sidewalks, 73.3 per cent are connected to the public sewage network, 94.4 per cent have piped water supplies, and 90.5 per cent have solid waste collection services. The indicators that account most for unequal living conditions are those related to basic sanitation, especially those regarding connection to the sewage system, given that the problem of piped water supplies was largely solved during the 1970s. It should also be stressed that the problems relating to paved roads and pavements are due to the multiplication of suburban areas corroborating the cumulative nature of social exclusion. Infrastructure services are built up and expand, beginning from the city centre area and from the most established urban cores.

Table 1 highlights some notable variations between the strata in terms of infrastructure and service provision. For instance, close to two-fifths of the households in Stratum V and more than two-fifths of those in Stratum VI are not connected to public sewage systems. Table 2 shows neighbourhood characteristics by stratum. This shows how the nature of unequal urbanization is reinforced by the existence of particular environmental problems. The dynamics of territorial homogeneity relative to environmental threats reinforces the fact that households which are affected by living on low and flat land alongside water courses are also affected by floods. The most privileged areas of the city



**Table 1: Provision of Basic Infrastructure and Services, according to Households' Socio-economic Stratum (percentage of households)**

Infrastructure and services	Stratum I	Stratum II	Stratum III	Stratum IV	Stratum V	Stratum VI	Total
Paved roads and sidewalks	90.4	96.6	83.1	73.2	58.6	60.5	73.6
Public water supply	94.2	97.7	94.9	96.2	91.6	93.5	94.4
Public sewage system	92.3	97.7	80.9	73.2	60.2	58.1	73.3
Public lighting	94.2	98.9	94.5	92.5	86.1	84.7	91.1
Electricity	94.2	97.7	97.1	95.8	89.6	94.3	94.5
Solid waste Collection	92.3	97.7	93.3	87.7	87.6	89.3	90.5
Total households sampled	52	87	272	213	251	125	1000

are not affected, while the most needy strata reflect the convergence of several urban problems, thus confirming the existence of precarious socio-environmental conditions.

Table 3 shows the divergence in what households in the different strata consider to be the main problem within their neighbourhood. Overall, 13.3 per cent of households consider air pollution as the most serious problem, followed by violence with 12.8 per cent, the lack of public health services with 10.4 per cent, and the lack of green areas with 8.3 per cent. But the population in the areas with the best quality infrastructure (inhabited by the highest income strata) give much more importance to air and noise pollution as a problem than do the lowest-income populations. The lowest-income groups are more concerned about immediate issues and structural shortages in living conditions, so pollution problems are of secondary importance. The lack of public health services, as well as the problems more closely linked to the absence of infrastructure and urban services, received a higher proportion of responses in lower income strata. Yet there is a certain degree of homogeneity among the strata when the answers concern the quality of water supply and solid waste collection.

## **b. Household Environmental Concerns**

### **i. Water and Sanitation**

The main source of water is the public water supply network, which covers 94.4 per cent of households and with only small differences in supply among types of dwelling and between the six strata. Overall, two-thirds of households have a water tank

**Table 2: Environmental Characteristics of the Neighbourhood, according to Households' Socio-economic Stratum (percentage of households)**

	Stratum I	Stratum II	Stratum III	Stratum IV	Stratum V	Stratum VI	Total
Flood plain	3.9	10.3	13.6	9.4	22.9	31.4	16.4
Ditches	17.6	8.0	46.7	39.4	52.0	65.0	43.9
Flood area	3.9	21.8	30.0	44.6	31.6	36.6	32.3
Green area	73.1	55.2	45.0	31.9	40.2	36.6	42.3
Squares	69.2	75.9	47.6	51.6	22.3	13.0	41.4
Public parks	63.5	44.8	24.0	24.9	18.4	4.9	24.3
Vacant lot	21.2	27.6	49.3	36.6	72.8	73.2	52.1
Wasteland	7.8	5.7	24.1	18.9	24.7	29.5	21.3
Heavy traffic	62.0	70.1	63.2	52.6	35.1	41.5	51.7
Industries	19.2	34.9	55.2	44.8	29.6	17.2	38.2
Total	52	87	272	213	251	125	1000

**Table 3: The Main Problems in the Neighbourhood, according to Households' Socio-economic Stratum (percentage of households)**

	Stratum I	Stratum II	Stratum III	Stratum IV	Stratum V	Stratum VI	Total
1. Water quality	9.8	5.1	3.1	6.6	7.8	10.6	6.5
2. Pollution of rivers	2.4	1.5	5.7	8.2	5.2	7.1	5.7
3. Floods	2.4	1.3	7.4	11.2	3.9	3.5	6.1
4. Sewage	0.0	0.0	1.7	7.1	10.8	14.2	6.6
5. Solid waste	2.4	3.8	3.9	5.1	2.6	4.4	3.8
6. Air pollution	24.4	31.6	15.3	16.3	5.2	3.5	13.3
7. Noise pollution	24.4	16.5	3.9	1.5	1.3	4.4	4.8
8. Lack of green areas	2.4	13.9	10.5	7.7	7.8	4.4	8.3
9. Hillside instability	0.0	0.0	0.9	0.0	0.9	1.8	0.7
10. Traffic	7.3	2.5	7.4	3.1	0.9	1.8	3.6
11. Lack of public transport	0.0	2.5	5.7	3.6	8.2	11.5	6.1
12. Lack of day care centres	2.4	8.9	5.7	6.6	3.9	7.1	5.7
13. Lack of schools	0.0	0.0	6.1	1.0	3.0	0.9	2.7
14. Lack of health services	0.0	5.1	12.2	7.7	14.7	10.6	10.4
15. Violence	19.5	3.8	9.2	12.2	21.1	8.0	12.8
16. Lack of public lighting	0.0	0.0	0.4	1.0	0.9	1.8	0.8
17. Lack of electricity	0.0	1.3	0.0	0.0	0.0	0.9	0.2
18. Others	2.4	2.5	0.9	1.0	2.2	3.5	1.8

in the dwelling but there are large variations between the different strata. The lack of a water tank is far more evident in *favelas* with only 20 per cent of households having a tank compared to 90 per cent in single family houses. It is worth stressing the significant level of misinformation and inaccuracy regarding the maintenance of these tanks that is found in all types of households, as well as the existing risks arising from poor maintenance.

**Table 4: Environmental Problems as perceived by Households, according to Socio-economic Stratum (percentage of households)**

	Stratum I	Stratum II	Stratum III	Stratum IV	Stratum V	Stratum VI	Total
Sewage	3.8	5.70	16.9	25.8	32.7	36.0	23.5
Flooding	-	16.1	16.5	31.0	18.3	24.8	20.2
Pollution; ditches	13.5	23.0	39.7	38.0	41.2	51.2	38.3
Solid waste	3.8	14.9	27.9	33.3	31.2	41.6	29.2
Air pollution	71.2	81.6	70.6	72.8	47.8	45.6	63.2
Noise pollution	63.5	50.6	49.1	39.4	22.7	31.2	39.0
Problems with water quality and quantity	21.2	23.0	27.2	28.2	53.8	56.0	37.0

Among the households, 37 per cent noted that water shortage and irregular water supply are a major problem. The lowest income strata emphasize the problems related to water shortage and its irregular provision, and explicitly mention the impacts that these problems have on their daily lives. They also have much more limited facilities for water storage. There is a clear distinction between the priority given to quantitative factors in water supply by the strata living in less established areas and that given to qualitative factors by those living in more established quarters of the city.

The families have a "present oriented" perception, i.e. a perception about what most directly affects the daily management of the household. The crossing between two variables (problem times impact) shows a clear concentration on two problems (water shortage and irregular water supply) and on the ways they affect the family (personal hygiene and laundry). These data indicate that the dynamics of the interrelationship between problem perception and impact perception occur basically as a result of what affects people most in their daily lives.

With regard to sewage problems, about 65 per cent of all household waste waters go into sewers, with 11 per cent of households having separate drains, 15 per cent using nearby waterways and less than 5 per cent dumping on the streets. The variations between strata shown in Table 4 confirm the extremely unequal conditions in the city. The most commonly cited problems are the "ill-smell", the proliferation of insects and harmful animals, and dirt, followed by problems of water seepage and contamination.

The responses of middle and low-income respondents are related to immediate effects - for instance their emphasis on the

“ill-smell” and “insect-attracting” aspects of the problem of sewage. When asked about how the sewage problem affects them, the answers focus on “insect-attraction” and “ill-smell”. This means that almost 75 per cent of households point to these as the most important issues. Health related aspects amount to 24.1 per cent of responses. The occurrence of the “insect-attracting” variable within the lower-income strata confirms once again the territorial distribution of environmental hazards.

## ii. Solid Waste Problems

Solid waste is collected in 95 per cent of households and, for 73 per cent, there is a collection three times a week exhibiting an adequate level of service. Although the issue of solid waste does not reveal itself as a very serious problem for households, this should not disguise the significant differences between strata and between locations, with the quality of the services declining the greater the distance from the city centre. Only 3.8 per cent of Stratum I households perceive solid waste collection as a problem compared to 41.6 per cent in Stratum VI.

Concerning the kinds of problems that are mentioned, three aspects are emphasized:

- \* proliferation of insects and rodents;
- \* people throwing garbage onto the street; and
- \* people throwing garbage into ditches and small rivers.

Households have a good evaluation of the services, and a critical attitude towards the practices of others who are predatory, irresponsible and uncommitted to their neighbours' well-being, thus resulting in deteriorated areas and precarious conditions in the maintenance of streets, ditches and other community areas.

## iii. Problems of Air and Noise Pollution

Air pollution is the most serious environmental problem according to 63.2 per cent of the households surveyed. Within the higher and medium-income strata, the figure rises to more than 70 per cent, whereas it reached at most 50 per cent in suburban and lower-income quarters. Emissions from motor vehicles and dust are considered the main sources of air pollution.

The general shape and stratification of the kinds of pollution that occur in different areas of the city allow us to describe different perceptions and impacts experienced in this context of unequal and unplanned urbanization. Most households emphasize health related aspects as those that affect them most, namely respiratory diseases, eye irritation, headache and nasal irritation. Other problems such as those related to cleaning up conditions are quoted by less than 20 per cent. There are significant differences between strata and between locations. The more distant the household from the city centre the more the dwellers emphasize the impact of air pollution types that are related to urban exclusion, such as dust, soot and foul smells.

In central and inner suburban areas, a stronger emphasis is given to vehicular pollution.

The problems that are most often mentioned which result from motor vehicle emissions and dust are: "it dirties the house", irritation of the eyes, nasal irritation, sore throat and headache. These express the impact of those factors that generate immediate responses for having direct effects on the household and its dwellers. Again, there are significant differences between the strata. In Stratum I the impact of industrial emissions is of low significance; the number of responses emphasizing motor vehicle emissions is five times higher. In this, the high income stratum, the most commonly expressed effect was "it dirties the house" (86.1 per cent), followed by eye irritation (75 per cent), and nasal irritation (66.7 per cent). The second most commonly referred to air pollutant is soot, followed by dust. This is also the case in Stratum III (middle classes), although a significant difference is found in terms of the source of polluting emission (motor cars) and of the "it dirties the house" effect.

With regard to the effects, and comparing all strata, most answers reflect the different and immediate impacts on people's daily lives, namely dust and dirt in the house. The second most common response to effects relates to headaches and to nasal and eye irritations, all of which are also immediate effects. Thus, regardless of the social stratum, the number of answers which relate pollution problems to serious impacts on health conditions, such as the answers on diseases, is much less significant. This reinforced the fact that dwellers emphasize the immediate effects of pollution.

Far fewer households mention noise pollution. On average, 39 per cent mention noise pollution problems but this ranges from 63 per cent in high-income strata to 23 per cent in low-income strata. With regard to the sources of noise pollution, 80.7 per cent mention traffic followed by 7.6 per cent mentioning the noisy neighbourhood and 13.7 per cent industrial noise. With respect to noise pollution problems caused by motor traffic, the pattern is a centre-suburban gradient that ranges from 100 to 95.5 per cent in high-income strata, to 48.7 per cent in low-income strata. When asked about what most affects the dwellers, "irritation/nervous stress" is mentioned in 40.1 per cent of cases followed by "it disturbs sleeping" (22.4 per cent) and "headache" (11.5 per cent). These three impacts accounted for 70 per cent of all answers.

### c. Household Socio-Economic Situation

Of the 1,000 households interviewed, 59 per cent own their house, 22 per cent live in rented accommodation, 10 per cent lease and 10 per cent are squatters. As to the type of dwelling, 52.3 per cent are single family houses, 18.9 per cent are *favelas* (squatter settlements), 16.2 per cent single family flats, 10.3 per cent precarious single family houses, and 1.9 per cent collective rented houses. When the social status variable is associated with the type of dwelling, the distribution by stratum shows the different forms of house occupation. When the type of dwell-



ing is considered, it can be seen that most single family flats are self-owned. So too are precarious single family houses. As to *favelas*, most dwellers also state that they own their houses. The only dwelling type not included in this category is tenement houses, where nearly 85 per cent of the households are tenants.

With regard to housing conditions, of the rented dwellings only 1.9 per cent are *favelas*, while 54 per cent are single family houses and 25 per cent are single family flats. Of the self-owned dwellings, 60.4 per cent are single family houses, 14.5 per cent single family flats and 16.8 per cent *favelas*.

With regard to consumer goods, some are present in virtually all households; a stove, liquidizer, iron, refrigerator and radio are owned by more than 85 per cent of the households. Other goods are less common but are still present in many households and are indices of existing consumption levels in a metropolis such as São Paulo. More than two-thirds (67.8 per cent) have a colour television, 41.1 per cent have a black and white television, 57.5 per cent have a tape or record player and 43.8 per cent have a washing machine. For these goods, variations between strata are significant. Washing machines are present in 86.5 per cent of households in Stratum I compared to 26.6 per cent in Stratum VI. For colour television, the variation is smaller with 96.2 per cent in Stratum I and 52.0 per cent in Stratum VI. Some household appliances are very stratified, as with microwave ovens which are owned by 32.7 per cent of households in Stratum I and 3.2 per cent in Stratum V. With regard to vehicles, 30.4 per cent of households have bicycles, with no significant variation between the strata, except for Stratum VI. Only 2.7 per cent of households have motorcycles and 32.6 per cent have automobiles, with variations ranging from 67.3 per cent in Stratum I to 14.6 per cent in Stratum VI. Of the 321 households with automobiles, 20.8 per cent have more than one.

#### **d. Household and Hygiene Conditions**

Almost all households use bottled gas (93.1 per cent) and only 6.7 per cent use gas from the municipal gas supply network. The gas supply network is concentrated in the city centre which is inhabited by the highest-income strata. Nearly all families living in the most precarious dwellings use bottled gas, and 85.2 per cent cook inside their households. Only 6.3 per cent have a separate kitchen and 8.2 per cent have a bedroom/kitchen type of dwelling.

Overcrowding is a problem mainly for the population living in precarious dwellings. Around 26.0 per cent of the households said that their dwellings do not have rooms where more than three people sleep, and these were mainly in the areas with old and run-down houses. Considering the densities in precarious dwellings, in 42.7 per cent of these households there is up to one person sleeping per square metre; in 22.5 per cent there are up to two persons sleeping per square metre; and in 20.2 per cent, up to three per square metre.

With regard to ventilation, 81.9 per cent of households have outward-opening windows in the rooms used as bedrooms. Of the 18.1 per cent without windows, most are located in areas where collective dwellings are dominant.

The great majority of households (87.2 per cent) have a toilet inside the house, 10.3 per cent have the toilet outside, and 2.5 per cent have a collective toilet. The variations between strata vary from 100 per cent in wealthy regions to 93 per cent in low-income areas, and from 100 per cent in single family flats to 57.9 per cent in collective rented houses. Of those not having a toilet, 8.8 per cent are precarious single family houses, 8.5 per cent are *favelas* and 42.1 per cent are tenements houses. Only 3.6 per cent of the sample do not have a toilet.

More than 70 per cent of the households have a toilet connected to the sewage system, with the variation ranging from 100 per cent in Stratum I to 58.8 per cent in Stratum V. For those lacking a connection to the system, the most common response is a water closet connected to a ditch, which is mainly the case in *favelas* and precarious single family houses. The next most common response is the water closet connected to a septic tank (6.4 per cent), mainly found in precarious single family houses and collective rented houses. Of the rest, 1.0 per cent have a latrine over a waterway while 3.5 per cent have a latrine connected to an improvised tank.

Of all precarious single family houses, 51 per cent have a water closet connected to the sewage system, 21.4 per cent are connected to a nearby ditch and 19.4 per cent to a septic tank. In the *favelas*, 35.9 per cent of households are connected to the sewage system, 46.7 per cent to a ditch and 7.6 per cent to an improvised tank. In the collective houses, 78.5 per cent have a water closet connected to the sewage system.

Nearly 25 per cent of the households have up to two taps, mainly in the lower-income strata. Less than 1 per cent of the households have no taps and most have more than three taps. Almost 80 per cent of the households boil, filter or chlorinate the water, indicating that, in general, there is concern about preventing health problems caused by contaminated drinking water. Most of the people who gave a clear reason for not taking care are concentrated in the lower-income strata and they consider the water to be of good quality. The higher-income strata appear to give less credence to the quality of the water. This is likely to be the effect, on the one hand, of a greater amount of information but, on the other, of greater concerns about health, by virtue of their economic situation.

## V. HEALTH AND HOUSEHOLD ENVIRONMENT

**THE RESEARCH LOOKED** at the relationships between the household environment and the incidence of diarrhoeal diseases and respiratory diseases in children under the age of six. The analysis of existing and significant relations between health and housing is complex because it supposes previous detailed considerations. Some that are considered relevant to the research

are stressed, namely:

- \* qualitative differences between types of dwelling;
- \* density of dwelling;
- \* location within the urban context (whether central or peripheral);
- \* existence of infrastructure; and
- \* respondent's educational level.

Table 5 presents a summary of the findings. In 33 per cent of the cases, at least one child in the household had health problems, mainly in the middle-low and low-income strata. In 11.4 per cent of households there had been an incidence of diarrhoea within the two weeks prior to the interview and these occurred mainly in precarious housing. Diarrhoea in children under the age of six, when associated with the type of dwelling, confirms the relevance of this variable in the context of household health. Of the households with a case of diarrhoea, 13 per cent lived in single family apartments with 21.7 per cent in single family houses, 23.9 per cent in precarious single family houses and 41.3 per cent in *favelas*.

**Table 5: Prevalence of Diarrhoea and Respiratory Diseases in Children under Six by Socio-economic Stratum and by Housing Type**

Of the 418 households with children under six, 11.4 per cent had had diarrhoea within the two weeks prior to the interview, while 27.2 per cent had had respiratory diseases within the two months prior to the interview.

Stratum and number of households	Percentage of households (n=139)	Percentage with diarrhoea within previous 2 weeks	Percentage with respiratory disease within previous two months
		(n=47)	(n=113)
I (14)	---	---	---
II (26)	---	---	---
III (105)	28.6	14.7	22.6
IV (98)	36.7	8.2	24.5
V (126)	31.7	12.1	28.2
VI (49)	34.7	16.3	32.7

**By housing type**

Single family apartment	13.0	20.7
Single family house	21.7	34.2
Single family precarious house	23.9	14.4
<i>Favela</i>	41.3	27.0
Tenement/collective rented house	0.0	3.6

\* percentage was not calculated because the total was less than 30 cases

Most of the cases of illness were in precarious dwellings and in low-income areas, mainly in *favelas* and peripheral precarious housing. When the interviewees were asked about the factors that caused the illness, the answers were: domestic food (19.5 per cent), food consumed outside the house (11.9 per cent), in-house water (14.3 per cent), water consumed outside the house (4.9 per cent). Thus, the perception of diarrhoea-causing factors involves much more the household setting rather than external household settings. The respondents' perception of the main problem in the neighbourhood, especially in those households where cases of diarrhoea in children were recorded, was not related to health and sanitation problems but mainly to the precarious conditions of mass transportation, accounting for 30.0 per cent of responses. Daily problems that directly affect the occurrence of diarrhoea in children were mentioned only in third place with the lack of a sewage system in sixth place. It is understandable that poor transport was seen as the most pressing problem because of its importance for people going to and from sources of work and thus closely connecting it to households' living conditions.

Another variable that is relevant to the context in which diarrhoea occurs is the respondent's level of education. More than 90 per cent of the incidences of diarrhoea occurred in households where the female respondent had, at the most, primary school education, indicating a strong relationship between income level, level of education and the occurrence of diarrhoea in young children.

The second health problem considered was the occurrence of respiratory problems in children under the age of six in the two months prior to the interview. These occurred in 27 per cent of households, mainly in intermediate and suburban areas. With regard to symptoms, there was phlegm in 73.9 per cent of cases, a dry cough in 70.6 per cent and runny noses in 76.9 per cent. In terms of respondents' perception of the cause, 27 per cent mentioned dampness, 13.6 per cent gutters, 12.7 per cent overcrowding, 29.1 per cent a lack of ventilation and 64.9 per cent air pollution. Most of the cases occurred in precarious housing, mainly in tenements and dwellings located on the periphery of the city.

## VI. PROPOSED SOLUTIONS AND ACTIONS FOR ENVIRONMENTAL PROBLEMS

**THIS SECTION PRESENTS** the findings on inhabitants' perceptions of the environmental problems that affect them - water supply, sewage, solid waste and air pollution - and on whether the solution to problems should be through government, community or individual action. Table 6 summarizes the findings, by socio-economic strata, of who respondents considered to be the key actor in addressing problems.

### a. Water Supply

The most commonly voiced household concern was on halting the pollution of the city's rivers, watersheds and reservoirs. Variations between the six strata were not very significant. The second most commonly voiced concern was the need for a better quality and more reliable supply. Lower strata stressed this aspect most. The first concern has a more strictly socio-environmental characteristic whilst the second is more closely linked to the deteriorating daily access to basic services, with a direct impact on living conditions.

The third most commonly voiced concern was the need to control industrial and domestic waste, and sewage disposal and, here too, there was little variation between strata. The fourth concern was the improvement in water quality and the fifth was the conservation of areas to protect watersheds; again, there was relatively little variation between the six strata.

If three aspects are considered together - halting pollution, controlling emissions and protecting watersheds - 55.9 per cent of households reflected a perception of the negative effects of deteriorating water quality on the urban ecosystem. It is worth emphasizing that there is very little difference between strata on the perception of these socio-environmental aspects. In contrast, there are significant differences between strata in those aspects directly related to consumption, namely improving water quality and ensuring water supply. Higher income strata emphasize the issue of water quality while lower income strata set as their priority the need for a regular water supply.

With regard to the kind of action that should be taken to address the problem, 88.2 per cent of respondents chose the option "through government action" with little variation between strata (see Table 6). "Through community or neighbourhood action" was chosen by only 8.8 per cent of respondents, with individual action chosen by only 3.1 per cent. With regard to solutions, households mostly emphasized solutions arising from public actions - the need for more public inspection and for greater effectiveness in enforcing laws concerning the protection of watersheds and sources of water. They also stressed the need for educational efforts to inform and generate awareness about environmental problems. Thus, households have a perception about the degradation of water sources and the need to change attitudes and inform, guide and educate the population about the risks brought about by the deterioration in water quality.

### b. Sewage

Almost 45 per cent of the households stressed the need to expand the sewage system to *favelas*; the need to expand the city's sewage network was stressed mainly by the lower-income strata. More than 87 per cent of households chose government action as the main means of addressing this problem with 10.4 per cent stressing community action, and 2.3 per cent stressing individual action.



**Table 6: Respondents' Perception as to which Actor should Undertake Action on Environmental Problems by Socio-economic Stratum (Percentage of households)**

	Stratum I	Stratum II	Stratum III	Stratum IV	Stratum V	Stratum VI	Total
<b>WATER N=948</b>							
Government	94.0	74.1	89.8	90.9	90.2	83.8	88.2
Community	4.0	21.2	7.9	5.1	6.9	13.7	8.8
Individual	2.0	4.7	2.4	4.1	2.9	2.6	3.1
<b>SEWAGE N=962</b>							
Government	85.7	81.2	83.5	90.6	91.1	87.1	87.3
Community	10.2	15.3	14.6	7.4	6.1	12.1	10.4
Individual	4.1	3.5	2.0	2.0	2.8	0.8	2.3
<b>SOLID WASTE N=951</b>							
Government	85.4	72.6	72.6	77.5	64.0	65.8	71.2
Community	12.5	20.2	19.0	13.0	17.0	19.2	17.0
Individual	2.1	7.5	8.3	9.5	19.0	15.0	11.8
<b>AIR N=951</b>							
Government	93.5	86.0	88.5	89.5	91.5	84.9	89.1
Community	4.3	11.6	7.5	7.0	4.8	9.4	7.0
Individual	2.2	2.3	4.0	3.5	3.6	6.7	3.9

With regard to solutions, interviewees were given six options. Sixty seven per cent pointed to several ways in which the population could be encouraged to act to avoid environmental degradation, through educational campaigns. The one most stressed (35 per cent) was to stop people dumping waste in street drains. The next was to stop the contamination of water sources with sewage and to teach people to make proper use of the sewage system. Here, there were no significant differences between strata. It is worth noting the importance assigned to educational campaigns and to forms of action to be taken by communities with government taking a supportive role.

### c. Solid Waste

The most widely accepted solution to the problem of solid waste, noted by almost half the interviewees, was to educate people not to dump waste in vacant lots and ditches. With regard to who had responsibility for solving the problem, the answers were similar to water supply and to sewage, although with less emphasis on government action (with 71.2 per cent) and more on community action (with 17.0 per cent). Greater stress was also placed on individual action with 11.8 per cent. Resolving solid waste related problems is seen by all strata as involving both individual and collective contributions on environmental con-

servation. This results from the issue being more directly related to households' daily habits and practices, and more amenable to action by each household unit.

Solutions related to educational campaigns are those that receive most support, followed by those that require a wider commitment from the community to ensure better sanitation. Since households show an interest in education campaigns, it suggests the need to assign greater public support to educational campaigns, as well as assigning joint responsibility to communities to prevent the environmental problems caused by the improper disposal of solid wastes and its effects on the city's basic health and sanitation conditions.

There is household concern for environmental degradation which exhibits a growing awareness of the impacts of existing degraded areas and their effects on daily life, irrespective of the stratum from which people come. It also shows the feasibility, in terms of encouragement and legitimacy, for developing educational campaigns.

#### **d. Air Pollution**

With regard to air pollution, all responses assign a shared responsibility to the public and private sectors. The need for action by both these sectors is obvious since some problems will only be reduced by a response from individual households to initiatives undertaken by the public authorities. The two most widely stressed aspects for the control of air pollution are related to checks on motor vehicle and industrial emissions; these accounted for 40 per cent of all responses. The other most common aspects, in order of priority, are related to city management (improved public transport, tree planting, setting up green areas, and paving roads).

Another aspect to be stressed, and one that implies socio-cultural changes in the attitudes of the households, is related to the use of automobiles in the city, namely the reduction in the volume of vehicles in circulation. This accounted for 9.0 per cent of responses. In general, solutions involving changes of behaviour received less support than solutions dependent mainly on actions taken by the public authorities. Most respondents (89.1 per cent) thought that the problems of air pollution should be addressed through government action, with community action stressed by 7.0 per cent and individual action by 3.9 per cent. The third component in people's evaluation on how to address air pollution stressed government action - the need to control the emission of vehicular and industrial pollutants, diminish the number of cars in circulation and several types of improvements at neighbourhood level. The need to control pollution emissions in the first place was stressed, followed by improvements for reducing air pollution through, for instance, tree planting. The need for educational campaigns was also stressed. All three of these areas of action are in the public sector, although interest in educational campaigns suggests an acceptance of the need for individual action as well in helping to solve the problems.

Community mobilization does not receive a high priority from respondents, either for suggesting solutions or in denouncing environmental destruction (see Table 7).

**Table 7: The Importance given by Respondents to Community Mobilization to address Environmental Problems**

	Water	Sewerage	Solid Waste	Air
1. Community mobilization to demand and suggest	4.3	6.5	3.2	6.0
2. Community mobilization to denounce environmental destruction	4.2	6.0	4.0	6.6

Community mobilization is seen to be more relevant to sewage and air pollution problems since these are thought to generate greater damage to the city's environment. There were some differences in the responses given by different strata but they were not significant in terms of different behaviour among the social groups. The strata most concerned about quality of life do not register more complaints against environmental problems that can degrade their surroundings. Neither do low-income strata living in areas with a lower quality of life show a greater concern for community mobilization or have a practice of collective organization (social movements). This low priority for community or collective mobilization exists despite the fact that many solutions are stressed which, although initiated or oriented by government, also imply behavioural changes, co-responsibility, solidarity and collaboration through the involvement and motivation of citizens. The data presented here show the existence of a very important mobilizing potential, although the answers express an attitude that understands that the solutions will have to come from the public authorities. It is noteworthy that for sewage, garbage collection and the control of insects, where collaboration from inhabitants is necessary, the households' answers show a perception and an openness about facing the problem. These findings appear to be relevant because they show that innovative enterprises concerning environmental management can be well received. This is especially so for those involving joint actions by both the public and private sectors and thus with a greater commitment and motivation by the inhabitants to engage in practices that prevent or reduce environmental problems.

## VII. CONCLUSIONS

**THE FINDINGS CONFIRM** the existence of the well-known differences and inequalities between the central, intermediary and peripheral suburban areas of this metropolis, and highlight how precarious the conditions are for the lowest-income sectors of the population that live in the city's periphery. These differ-

ences and inequalities are mainly the result of access/non access to public services and the added environmental risks from living in inadequately urbanized areas (for instance areas lacking paved roads and sewer networks).

On the one hand, the strata living in the well urbanized regions of the city and having access to all services emphasize the need to improve water quality and air quality. On the other hand, the strata living in peripheral areas emphasize the need to improve their access to basic urban services and to increase the quantitative aspects (water supply, solid waste collection).

The assessment of environmental problems in the city of São Paulo indicates that the main problems are air pollution, degradation and pollution of water sources and the effect of uncontrolled solid waste dumping. With regard to problems where environmental issues are linked to the performance of public services, the research indicates satisfactory responses towards water supply and solid waste disposal, which are adequate in practically all areas and socio-economic sectors of the city, and inadequate responses for sanitation - especially the provision of sewers which have not yet reached all regions of the city to an equal degree.

Other outcomes of the research are related to the habits and practices of households facing the maintenance of domestic equipment such as water tanks, and the habit of dumping waste in public areas such as streets, sidewalks, ditches, rivers, vacant lots and wastelands. In the case of water tanks, what can be observed is the level of disinformation and imprecision in all types of housing on the risks associated with poor maintenance.

Another important conclusion is that households give much more emphasis to those aspects that are directly linked to their daily lives. Interviewees stress the immediate impact of environmental problems. Their perceptions are generally oriented towards the constraints and discomforts that these problems provoke in their daily lives. This can be seen when analyzing the importance given to problems of water availability. The deficit in terms of those lacking piped water is not very significant at the city level - in comparison to the provision of sewers where there is a significant deficit concentrated mainly in the more deprived areas of the city. Similarly, with regard to the effects of air pollution, households stress the impact on house maintenance issues.

These perceptions by households point to the fact that they lay less stress on the health impacts of environmental factors, as they do not perceive them as having a direct impact on their family's daily lives. Their familiarity with environmental damage is related to a set of interactions that include socio-economic factors, political-administrative factors, informational and socio-cultural factors, be they obstacles or advantages. The research certainly shows that most households are aware of the existing measures and possibilities for preventing diseases and other negative impacts of environmental degradation. Although this perception of the problems exists, households generally accept living with these different problems - and this is so in all six strata.

The research provides the basis for more qualitative questions, to provide a more in-depth understanding on perceptions and practices in the population - their ambiguities and contradictions. In other words this might lead to more in-depth knowledge on the chain of relations between what the households may or may not identify as being environmental problems, what they detect as the source and cause of the problems, and what directs their attitudes towards possible solutions.

Another outcome is related to the issue of information/misinformation. The research indicates a lack of information on certain issues in all strata, city regions and types of housing. The misinformation is related to:

- \* maintenance of water tanks and containers;
- \* costs and monthly charges for public services such as solid waste collection and sewerage; and
- \* risks to health resulting from environmental factors.

The importance given to government as the actor responsible for preventing environmental degradation indicates that there is an overall understanding that, although there is a role to be accomplished by citizens, the public authorities should direct the process. Most households perceive that solutions should come from local government and it is this level of government which is mainly responsible for encouraging or stimulating changes in behaviour, and motivating co-responsibility and collaboration, i.e. promoting involvement by the citizens in a more interactive process. This also highlights the need for educational campaigns and greater public information to increase and expand the actions of the extant interactive processes. This allows collaboration between citizens and public authorities and shows people's readiness to accept involvement with innovative preventive measures to reduce environmental problems at household and neighbourhood level.

Solutions involving community and neighbourhood action occur mainly where households perceive their possible, effective and responsible role as a partner or as having joint responsibility towards preventing environmental degradation. What is also noteworthy is that these issues raise a set of aspects and socio-economic, political and cultural determinants. These are linked to the impact of degraded living conditions, disinformation and lack of awareness of environmental health risks by households, as well as their expectations and frustrations in the face of government action/inaction or omission when environmental related problems develop.

## VIII. POLICY RECOMMENDATIONS

**THE DEGRADATION OF** the environment in large cities such as São Paulo has generated large dis-economies of scale, mainly linked to the provision of water and sewage services and risks to human health. These result from the lack of adequate conditions for:



- \* the disposal of very large quantities of solid waste and sewerage;
- \* air pollution control; and
- \* land degradation as a result of the precarious investments and the inadequate management, monitoring and enforcement of regulations in the urban environment.

The management of environmental risks to human health is both a technical-political and environmental education issue. Thus, what has to be stressed is the need to broaden public involvement through efforts to increase citizen awareness and stimulate participation. Obtaining more qualitative indicators - although this is often biased by subjectivity and personal viewpoints - needs to be considered by the managerial process. The impact of inadequate public education, and the stereotypes established by the media create a social environment with little knowledge on the problems and processes involved in solving them. This research revealed a broader understanding of people's perceptions and attitudes within their narrow viewpoints, and mediations that include their ranking of issues and the kinds of interventions needed. It becomes a stimulating task to formulate strategies based on participatory interactions of non-governmental organizations in generating and maintaining socio-political commitment to achieve environmental management objectives - especially those oriented towards the poorest strata of the population.

To strengthen the institutional setting, it is necessary to ensure people have information on the availability, access and cost of scarce resources that enable them to establish links with their own perception of the environmental problems in their neighbourhood or region. This perspective assumes the importance of simultaneously finding more precise measures depicting peoples' social needs and expectations, indicating their direction of change, and evaluating the consequences of proposals for the management of environmental problems and their socio-cultural impacts.

The outcome of this research points to two directions in environment policy. The first is oriented towards the input of qualitative aspects emphasized by the research, mainly those directly linked with the potential of households to participate in the prevention of environmental degradation and to reinforce the importance of protecting, maintaining and controlling their local environment. The second is that as there exists a level of awareness among households the challenge is how to capture and transform it, and generate a process that spreads its influence.

It is also important to orient policies into not accepting as a given the great emphasis put by households on the role of government as the main form of action. There has to be an orientation to redefine this position based on destroying stereotypes of the role of government and on the lack of responsibility by households.

The challenge is to formulate and stimulate people to participate and collaborate through campaigns that will help to change people's attitudes and to help them become environmentally

better citizens. The main change to be sought is to motivate joint responsibility between households and public authorities in the management and control of sources of pollution, mainly when they are not at the household level. One cannot disentangle the role of the state and the role of citizens. This means that both responsibilities have to be stressed. The research on which this paper is based indicates that people are motivated to collaborate with government but government must take on its role in the orientation and management of the conflicts in the continuous search for safeguarding the general interest.

Four relevant actors have to be considered within this process; government, private actors (individuals and collective), entrepreneurs/NGOs, and international donors. All possible kinds of collaboration have to be generated to make concrete effective action to address the continuing environmental degradation.

A last aspect to be considered is the need to develop children's awareness in schools and community organizations. This implies building specific processes of knowledge from the research data, be they quantitative and/or qualitative.

There is a need to overcome much of the rhetoric implicit in documents on environmental problems and to ensure that people's perceptions (or lack of them) are an essential input into policy-making. The outcome of this research suggests that further work is needed on:

- \* how to improve information and understanding;
- \* strengthening governance; and on
- \* increasing processes for restoring accountability and control to the citizens.

As the issues of education and participation are well developed there is a need to stress input into the governance and decision-making aspects. The purpose is to propose adequate institutional formats for the development of efficient intervening instruments to consolidate issues on the sustainability of cities. Research has to be conducted to analyze the weight of institutional obstacles and the weight of unequal impacts of environmental degradation. Research is also needed on the role and needs of women. Finally, a new environmental agenda is needed that includes:

- \* new professional attitudes (environmental problems as multi-dimensional, interconnected, interactive and dynamic processes of information and support to community and citizen level initiatives);
- \* proposals for institutional formats well suited to the articulation, negotiation, planning and financing of government policies within a perspective of interaction between public and private sector; and
- \* policies to prepare environmental managers for a new style of development - anticipatory and preventive - within a decentralized perspective of action.